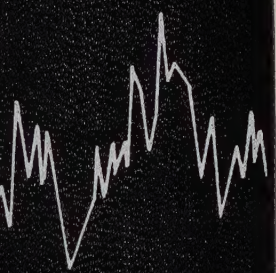
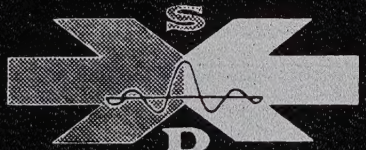
INSTRUCTION MANUAL

SD123
RANDOM SIGNAL VIBRATION PROTECTOR





SPECTRAL DYNAMICS CORPORATION OF SAN DIEGO

SERIAL 24

INSTRUCTION MANUAL

SD123
RANDOM SIGNAL VIBRATION PROTECTOR

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April 1969

SD123 RANDOM SIGNAL VIBRATION PROTECTOR

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RECEIVING INSPECTION PROCEDURE

The Model SD123 Random Signal Vibration Protector is shipped fully assembled, packed in a polystyrene case designed to protect it against all normal shipping hazards. Immediately upon receipt, inspect the exterior of the shipping case and note any visible damage. Keep all forms and invoices attached to the shipping case. Remove the instrument from the shipping case and test its functional operation in accordance with Section II of this manual. If shipping damage is apparent, file a claim with the carrier's claims agent and send a copy to Spectral Dynamics Corporation. Be sure to include the instrument name, model number, and serial number on all correspondence. Spectral Dynamics Corporation will advise the buyer what should be done; arrangements for repair or replacement will be made as applicable.

WARRANTY POLICY

All Spectral Dynamics products are warranted against defects in materials and workmanship. This warranty applies for one year from the date of delivery, or, in the case of certain components listed in some of the operating manuals, for the specified period. We will repair or replace products which prove to be defective during the warranty period, providing the failure or damage has not been caused by misuse or abnormal operating conditions. Fuses and lamps are specifically excluded from warranty. If the malfunction or a portion thereof is determined by Spectral Dynamics Corporation to have been caused by misuse or abnormal conditions of operation, an estimate of cost to repair will be submitted to the purchaser for approval before beginning any repair work.

Liability under this warranty is limited to servicing and adjusting the instrument returned to the factory, with transportation charges prepaid by the purchaser. No other warranty is expressed or implied. We are not liable for consequential damages.

If any malfunction develops, notify Spectral Dynamics Corporation or its representative in your area, giving details of the problem, and the name, model and serial number of the equipment. Upon receipt of this information, service data or shipping instructions will be provided.

RETURN SHIPMENT PROCEDURE

On receipt of shipping instructions, forward the instrument prepaid via air freight to the factory or authorized repair station indicated on the instructions. Replace the instrument in its original shipping case, or surround with two to three inches of shock absorbing material and then pack it in a heavy-weight cardboard box, wooden box, or other strong container.

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SECTION I

GENERAL INFORMATION

1.1 INTRODUCTION

The Model SD123 Random Signal Vibration Protector (RSVP) provides safety protection for the components in a random vibration analysis system. Smooth compression (≈80 dB) of the drive signal and safe shutdown of the system components are accomplished within 0.5 second, if the operating test level exceeds or drops below a preset dynamic testing range. Figure 1-1 shows a typical application of the SD123 RSVP operating as the protective coupling between an automatic equalizer/analyzer and the power amplifier in a random vibration test system.

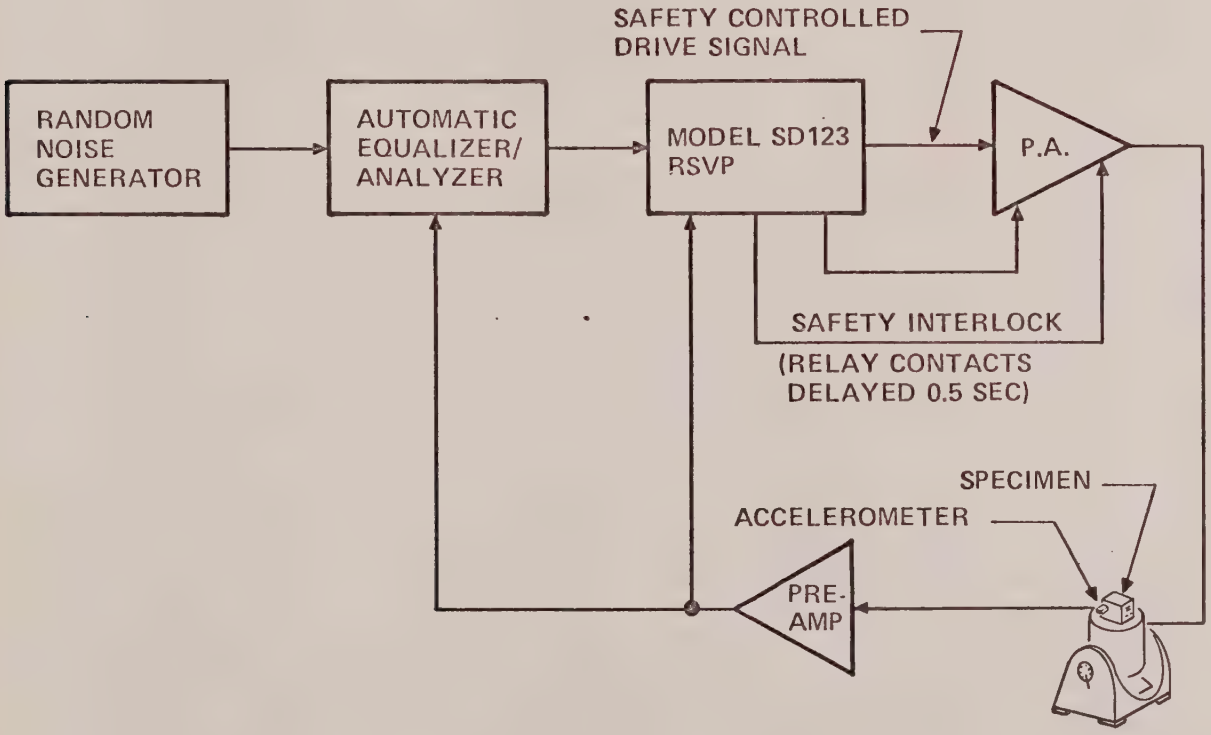


Figure 1-1. Model SD123 RSVP System Protection Concept

1.2 SPECIFICATIONS

INPUTS

Random Input - (from manual or automatic equalizer/analyzer)

Level	2 Vrms maximum
Impedance	50 kΩ
Dynamic Range	60 dB
Frequency Range	10 Hz - 4 kHz

Accel Input

Sensitivity	10 mV rms/g rms
Level	Adjustable 0.1-1000g (rms)
Impedance	100 kΩ
Frequency Range	10 Hz - 4 kHz

OUTPUTS

Random Output - (BNC type connector on rear of chassis)

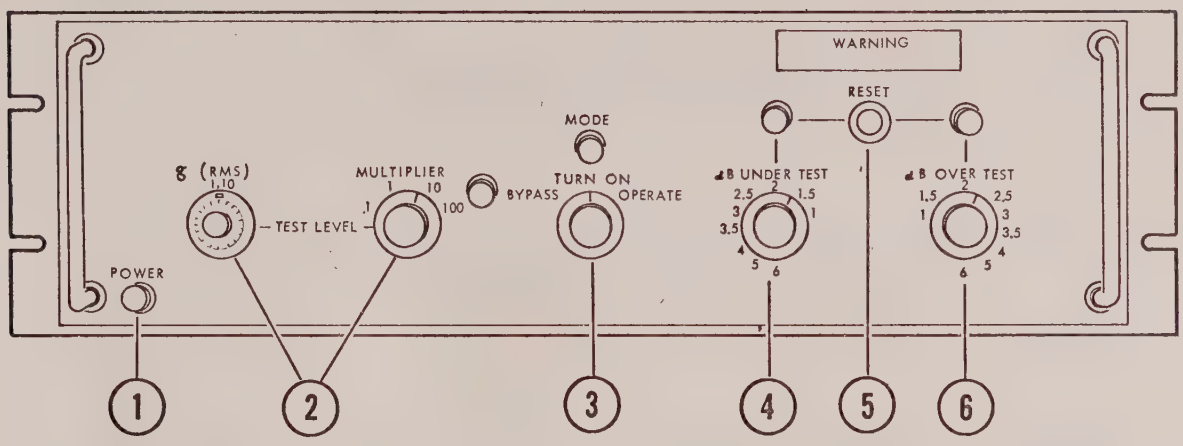
Level	2 Vrms maximum
Impedance	560Ω coupled through 50 μf (1 ma rms maximum)
Frequency Range	10 Hz - 4 kHz
Dynamic Range	>80 dB
Distortion	Less than 0.5% (0.2% typical)

POWER

105-125/210-250 Vac switch selectable on rear of chassis; 50/400 Hz at ≈ 20W.

DIMENSIONS

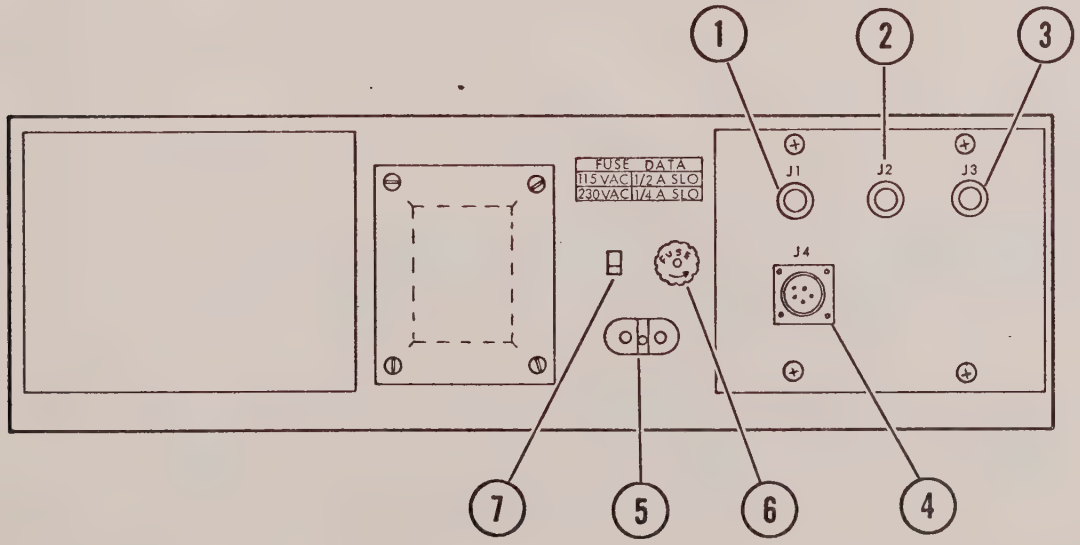
Height	5¼"	(13,3 cm)
Width .....Std. Rack Panel	19"	(48,3 cm)
Depth .....w/o Connectors	14"	(35,6 cm)
Shipping Weight	13 lbs	(5,9 kg)



NOTE

The circled numbers are keyed to the functional descriptions given in paragraph 1.3.

Figure 1-2. Front Panel Description



NOTE

The circled numbers are keyed to the functional descriptions given in paragraph 1.4.

Figure 1-3. Rear Chassis Description

1.3 FRONT PANEL DESCRIPTION

The descriptions given in the following paragraphs are keyed by circled numbers to their associated front-panel control or indicator as shown in Figure 1-2, Front Panel Description.

(1) POWER Indicator

Glows red when power is applied to unit. Note that there is no power switch on the SD123; power is normally supplied via the system main power control switch.

(2) TEST LEVEL controls

MULTIPLIER switch provides selection of four test level control ranges: .1 to 1, 1 to 10, 10 to 100, and 100 to 1,000.

The g (RMS) 1-10 control, a linearly calibrated 10-turn potentiometer, provides vernier adjustment of the vibration test level over each of the four control ranges.

The test level in g (rms) equals the MULTIPLIER switch setting times the g (RMS) reading. For example, if it is desired to control at a test level of 45g, set the MULTIPLIER switch to 10 and the g (RMS) control to 4.50 (4 in the window and 50 on the dial).

(3) MODE Switch and Indicators

Used to select the mode of operation; flashing indicators provide visual warning when system is not in OPERATE mode.

BYPASS - Input signal applied at J2, RANDOM IN, is routed directly to J3, RANDOM OUT. Assuming POWER indicator is lighted, red BYPASS indicator flashes at approximately 1-second intervals to indicate that no protection is being provided.

TURN ON- Allows system to be brought "on the air", if the ACCEL IN signal is not greater than the preset TEST LEVEL plus dB OVER TEST limit setting. Amber indicator flashes at approximately 1-second intervals. In this mode, system protection is afforded (and indicated) if an overtest condition occurs; however, no indication is given for an undertest condition.

OPERATE- Normally selected after the system has reached the preset TEST LEVEL, or at least slightly above the selected undertest limit level. In OPERATE mode, system is protected from both an overtest and an undertest condition.

1.3 FRONT PANEL DESCRIPTION (Cont'd)

(4) dB UNDER TEST Switch and Indicator

Used to select one of nine undertest dynamic operating limits (referenced to the TEST LEVEL control settings). The UNDER TEST indicator lights to indicate that the dynamic testing level has fallen below the preset level; also, Relay K1 is actuated, the RANDOM OUT signal is compressed approximately 80 dB, then Relay K2 is actuated in approximately 0.5 second. This condition of safety remains until the system is reset.

(5) RESET Push Button

WARNING

RESET ONLY WITH SYSTEM GAIN AT ZERO

Used to reset the SD123 protective circuitry after an undertest or overtest condition has occurred. In OPERATE mode, the SD123 cannot be reset until the dynamic test conditions are returned to the preset operating range. Normally, TURN ON mode is used to bring the system "on the air". In this mode, the SD123 can be reset if the dynamic test conditions are below the OVER TEST limit.

(6) dB OVER TEST Switch and Indicator

Used to select one of nine overtest dynamic operating limits (referenced to the TEST LEVEL control settings). The OVER TEST indicator lights to indicate that the dynamic testing level has tried to exceed the preset level. Relay action, signal compression, and reset requirements are the same as described above for the UNDER TEST condition.

1.4 REAR CHASSIS DESCRIPTION

The descriptions given in the following paragraphs are keyed by circled numbers to their associated rear-chassis function as shown in Figure 1-3, Rear Chassis Description.

(1) ACCEL IN (J1)

Accepts pre-amplified control-accelerometer signal, which is used to control the operation of the SD123 system protective circuitry.

(2) RANDOM IN (J2)

Accepts the random drive signal from automatic equalizer/analyzer for controlling by the SD123 compression circuitry. The gain through the unit, from RANDOM IN to RANDOM OUT is nominally unity until a dynamic test limit is exceeded; then the random drive signal is compressed approximately 80 dB.

1.4 REAR CHASSIS DESCRIPTION (Cont'd)

(3) RANDOM OUT (J3)

Provides controlled output of signal applied to RANDOM IN connector described above. (Normally connected to P.A. input.)

(4) AUX FUNCTIONS (J4)

Accepts Cannon GK-9-21C-1/2 connector for interconnecting K1 and K2 relay switching contacts to system components that are to be safety protected. (See drawings in Section II and schematic diagram for wiring information.)

(5) POWER IN

Accepts 3-wire plug and cable (supplied) for applying 115/230 Vac 50-60 Hz primary input power. Center terminal is chassis ground. Uses Belden No. 17258 cable.

(6) FUSE

Contains 3AG-type, SLO BLO fuse; 1/2A for 115V operation or 1/4A for 230V operation.

(7) 230/115 Switch

Facilitates changeover of primary power input circuit for either 230V or 115V operation. Proper input power to be applied shows in window; screwdriver blade slot is up for 115V operation and down for 230V operation.

SECTION II

OPERATION

2.1 GENERAL

The operation procedure described here is basic to the Model SD123 RSVP and is not intended to cover its many possible applications as a safety device. Refer to Section I of this manual for the description of all front-panel and rear-chassis connectors, controls, switches, and indicators.

2.2 PRELIMINARY POWERING

Check that the 115/230 switch on the instrument rear chassis is set to indicate the input line voltage, and that the proper value fuse is installed.

CAUTION

The SD123 does not have a power switch and is powered when the line cord is connected to the primary power source. When installing the unit, facilities should be made to control its power by means of the system master power switch.

2.3 OPERATIONAL CHECKOUT PROCEDURE

a. Connect the SD123 and test equipment as shown in Figure 2-1. The test equipment recommended is shown; however, test equipment having equal or better operating characteristics may be substituted.

NOTES

1) When constructing the relay test lamp circuit, make the leads from P4 (Cannon GK-9-21C-1/2) long enough to allow placing the test lamps in front of the oscilloscope; then both relay action and signal compression can be observed simultaneously.

2) If the test circuit is not constructed, a pair of ohmmeters may be used, one connected across the normally open (N.O.) contacts of each relay, K1 and K2.

b. Apply power to all equipment and allow proper warmup period. The SD123 requires only a 10-minute warmup.

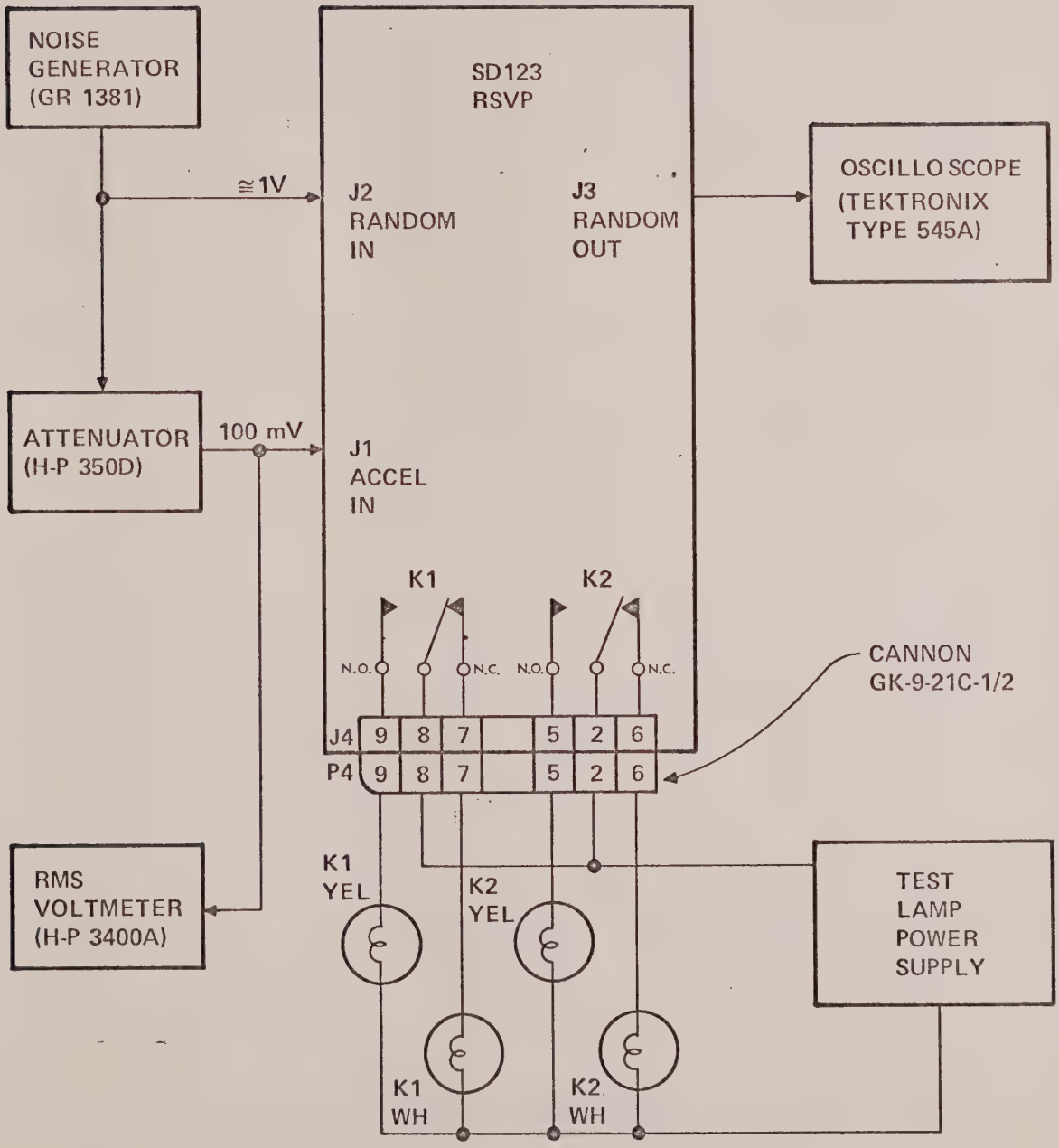


Figure 2-1. Equipment Setup for Operational Checkout

c. Set the MODE switch to BYPASS; the red BYPASS indicator should flash at approximately 1-second intervals. Both K1 (WH) and K2 (WH) test lamps should be lighted.

d. Set SD123 front-panel controls as follows:

g (RMS)	10
MULTIPLIER	1
dB UNDER TEST	1.5
dB OVER TEST	3

e. Adjust noise generator for 2-kHz bandwidth and 3σ clipping.

f. Adjust noise generator and attenuator controls for ≈ 1 Vrms at J2 and 100 mV ± 1 mV at J2. (The attenuator will be at ≈ 20 dB.)

g. Calibrate the oscilloscope and observe ≈ 1 Vrms random noise signal at J3; there should be very little, if any, clipping.

h. Set MODE switch to TURN ON; amber indicator should flash at ≈ 1-second intervals.

i. Set MODE switch to OPERATE. If necessary, press the RESET push button so that neither UNDER TEST nor OVER TEST indicator is lighted. Now return MODE switch to TURN ON and then set to OPERATE again; no transient or dropout of RANDOM OUT signal should be observed when switching between TURN ON and OPERATE.

j. Slowly increase the noise generator output until the OVER TEST indicator just lights; observe the following action:

   1) RMS voltmeter at J1 should read ≈ 3 dB above the 100-mV preset level of step f.

   2) K1 (WH) test lamp should go out and K1 (YEL) test lamp should light.

   3) The RANDOM OUT signal should decrease by at least 60 dB below 1 Vrms in ≈ 1 second.

   4) After ≈ 0.5-second delay from condition 2), the K2 (WH) test lamp should go out and K2 (YEL) test lamp should light.

k. Disconnect the input from J1, ACCEL IN; the OVER TEST indicator should remain lighted (the UNDER TEST indicator should not light), and both K1 (YEL) and K2 (YEL) test lamps should remain lighted.

2.3 OPERATIONAL CHECKOUT PROCEDURE (Cont'd)

l. Reconnect the input to J1, and adjust the noise generator for 100 mV at J1.

m. Press the RESET push button; the OVER TEST indicator should go out, both K1 (WH) and K2 (WH) test lamps should light, and the output at J3 should rise to ≈1 Vrms in less than 1 second.

n. Slowly decrease the noise generator output until the UNDER TEST indicator just lights. The level at J1 should be ≈1.5 dB below 100 mV rms. All other conditions should be as described in step j., 2) through 4).

o. Press the RESET push button and observe normal reset conditions as described in step m.

p. Set the MODE switch to BYPASS and observe same level of random signal on oscilloscope as for OPERATE mode.

q. Set the MODE switch to TURN ON and repeat step j. (Note that OVER TEST safety operation can occur in both TURN ON and OPERATE modes.)

r. With MODE switch set to TURN ON, press RESET push button, then reduce noise generator output to zero. Note that UNDER TEST safety operation will not occur; it will only occur in OPERATE mode (step n.).

s. Disconnect SD123 from all test equipment and place instrument in service.

2.4 OPERATION

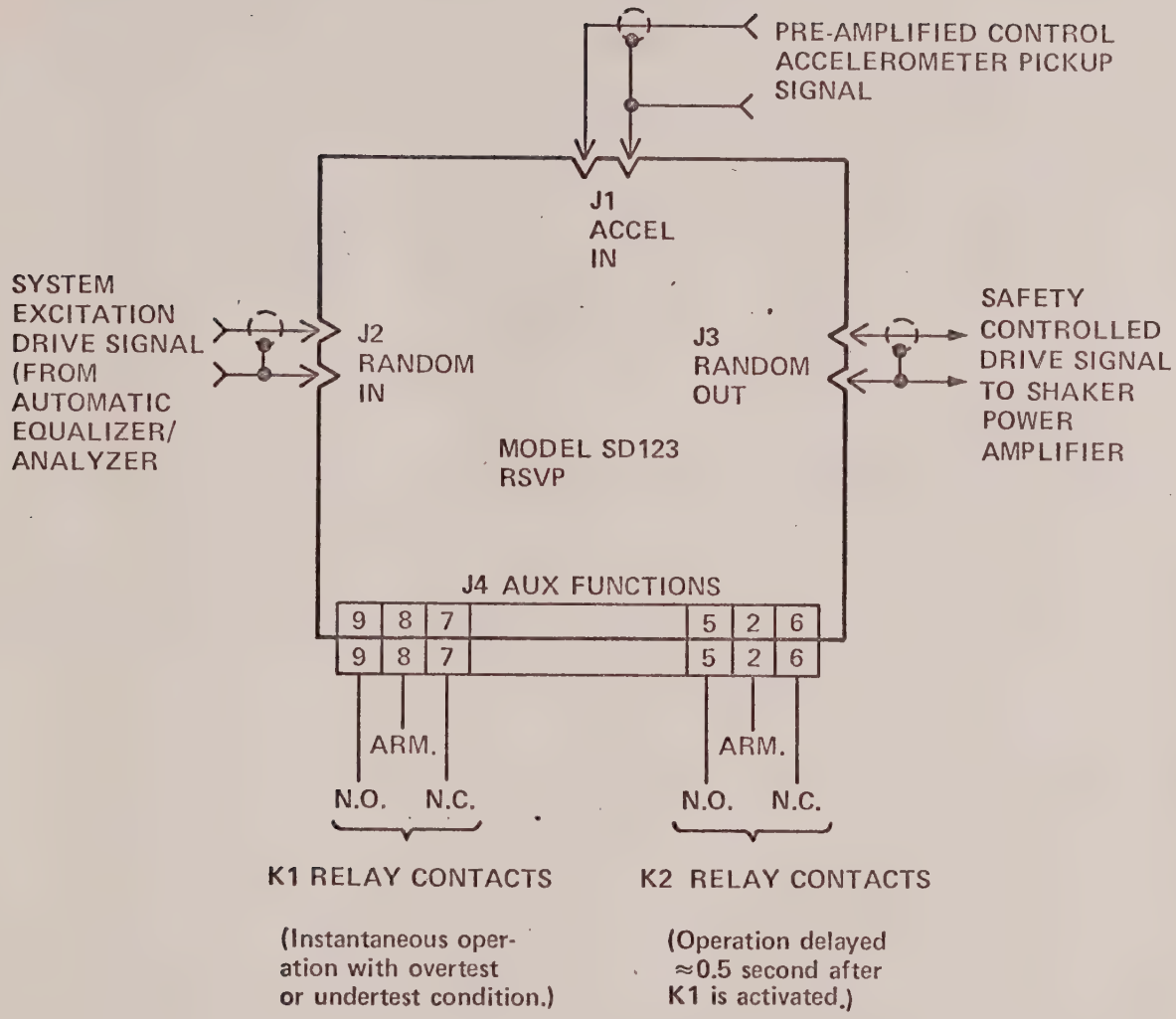
Figure 2-2 shows the SD123 RSVP input and output connections with signal data for typical system application.

CAUTION

If any instrument other than the Ling Model ASDE 80 is used, minor circuit modifications may be required. For information concerning any modifications, contact the Customer Services Department of Spectral Dynamics Corporation.

The following procedure assumes that the system has been properly interconnected, power is applied, and all units have been properly warmed up. The SD123 requires only a 10-minute warmup period.

a. After the automatic equalizer/analyzer has been set up for the particular test program, determine the overall g (rms) test level and test range limits.


PRE-AMPLIFIED CONTROL ACCELEROMETER PICKUP SIGNAL
J1 ACCEL IN
SYSTEM EXCITATION DRIVE SIGNAL (FROM AUTOMATIC EQUALIZER/ ANALYZER
J2 RANDOM IN
J3 RANDOM OUT
SAFETY CONTROLLED DRIVE SIGNAL TO SHAKER POWER AMPLIFIER
MODEL SD123 RSVP
J4 AUX FUNCTIONS
9 8 7 5 2 6
9 8 7 5 2 6
ARM.
ARM.
N.O. N.C.
N.O. N.C.
K1 RELAY CONTACTS
K2 RELAY CONTACTS
(Instantaneous operation with overtest or undertest condition.)
(Operation delayed ≈0.5 second after K1 is activated.)

NOTE: Although K2 is activated ≈0.5 second after K1, both relays are instantaneously deactivated when RESET push button is pressed.

Figure 2-2. Typical Application Connections

b. Adjust the TEST LEVEL controls on the SD123 for the desired g (rms) test level.

c. Set the dB UNDER TEST and dB OVER TEST switches to the desired under and over test range limits.

d. Set the MODE switch on the SD123 to TURN ON; the amber light should flash at ≈1-second intervals.

e. If either the UNDER TEST or OVER TEST indicator is lighted, observe the WARNING and press the RESET push button.

f. Using normal procedure, bring the automatic equalizer/analyzer "on the air". When the system g (rms) meter indicates the prescribed operating test level, set the MODE switch on the SD123 to OPERATE.

The SD123 RSVP will now provide safety protection for the system if the test level falls below or exceeds the preset level operating range limits.

SECTION III

CONCEPT AND THEORY OF OPERATION

3.1 CONCEPT OF OPERATION

The SD123 RSVP provides a means to safely shut down a vibration test system if either a preset undertest or overtest condition limit is exceeded. Operating as a variable gain amplifier between the output of an automatic equalizer/analyzer and the system shaker power amplifier, it provides unity gain until a preset test limit is exceeded. This is sensed from the output of an accelerometer attached to the specimen being vibrated. Then it smoothly compresses the shaker drive signal from 0 to approximately 80 dB over an approximate 0.5-second period, and provides both instantaneous and delayed relay contact switching circuitry for complete shutdown of other system components as desired.

3.2 BLOCK DIAGRAM DESCRIPTION (See Figure 3-1.)

The preamplified a-c output of a control accelerometer attached to a specimen being tested, is applied to J1, ACCEL IN. The signal is properly attenuated as a function of the MULTIPLIER switch setting, and then applied to the amplifier/rectifier circuit. The overall amplifier gain is controlled by the g (RMS) control. The amplified a-c signal is squared and full-wave rectified to produce a d-c voltage proportional to the square of the ACCEL IN signal. Note that the range of this dc $\propto$ (ACCEL IN)^2 signal is the same for each range setting of the MULTIPLIER switch. It is this squaring of the essentially constant amplitude signal that provides true rms operation.

The dc $\propto$ (ACCEL IN)^2 is applied to one input of each of the undertest and overtest comparator/amplifiers on the logic circuit card. Here it is compared to a reference d-c voltage selected by the dB UNDER TEST and dB OVER TEST switches respectively. If the dc $\propto$ (ACCEL IN)^2 falls below the dB UNDER TEST level or exceeds the dB OVER TEST level, the particular comparator/amplifier will produce an output to the K1 relay driver, thus activating relay K1. At the same time, the particular lamp driver is activated to turn on the front-panel UNDER TEST or OVER TEST indicator.

The -15V is routed through one set of K1 contacts and the RESET switch to hold K1 activated until the RESET push button is pressed.

Simultaneous with the activation of relay K1, the variable gain amplifier is driven into compression, 0 (unity gain) to -80 dB, in $\approx$0.5 second. Also, the K2 relay driver circuit is powered, and K2 is activated in $\approx$0.5 second.

When the MODE switch is set to BYPASS or TURN ON, the associated front-panel indicator is connected to a lamp driver and flashes approximately once every second. The common lamp driver is pulsed by the output of a 1-Hz free-running multivibrator (both are located on the logic circuit card). In the OPERATE mode, power is removed from the multivibrator and lamp driver circuit.

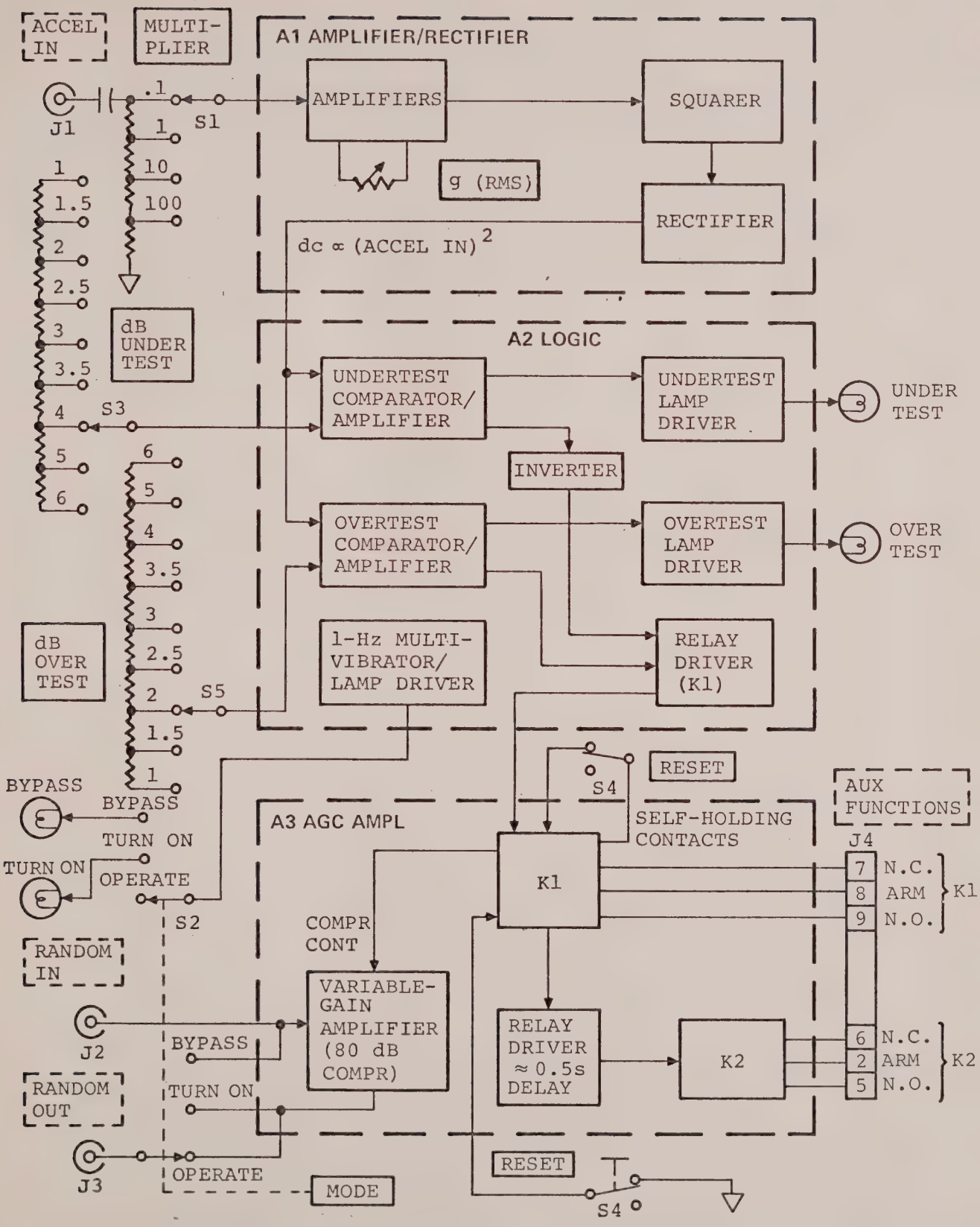


Figure 3-1. Functional Block Diagram Model SD123 RSVP

Power supply card A6, supplied by power transformer T1, provides all d-c operating voltages (±15 volts). The 115/230 switch connects the T1 primary windings in parallel for 115V operation or in series for 230V operation.

Both the -15V and +15V supplies use conventional solid-state diode rectification and electronic voltage regulation circuitry. However, note that the +15V supply regulation is slaved to the -15V supply. Both the +15V and -15V outputs are current limited, making them short circuit proof.

SECTION IV

CALIBRATION AND MAINTENANCE

4.1 GENERAL

Before calibrating the instrument, the technician is advised to study carefully Section III of this manual. Refer also to the front-panel and rear-chassis descriptions given in Section I.

Most voltage checks and adjustments can be made with the circuit cards installed. The controls and test points are identified on the circuit cards; other parts can be found by referring to the component layout drawing included with the schematic drawing in the back of this manual.

NOTE

A layout drawing showing the location of the circuit cards is located on the inside surface of the top cover.

Except for the extender card, each circuit card is individually keyed to its receptacle. Each card is slotted, and an insert is located between two pins of each receptacle. Therefore, the "key" must be removed before the extender can be inserted.

CAUTION

To prevent possibility of plugging a circuit card into the wrong socket, be sure to replace the "keys" after calibrating or servicing the instrument. On the layout drawing (under top cover), the location of each circuit card "key" is denoted by its two adjacent pin numbers. For example, on circuit card A1, the "key" is located between pins 15 and 16.

Throughout the calibration procedure, calibration controls and parts on a circuit card are referenced by their circuit card and part number alphanumeric designator. For example, on Power Supply card A6, R22 is referred to as A6R22. Similarly, circuit card pin connections are referenced by the circuit card alphanumeric designator, a hyphen, and pin number; such as A1-2.

Table 4-1 lists the test equipment required to calibrate the SD123; test equipment having equal or better operating characteristics may be substituted.

4.1 GENERAL (Cont'd)

Table 4-1. Test Equipment Required

Name	Model No.	Manufacturer
Digital Voltmeter	3440A	Hewlett-Packard
Plug-In Unit	3444A	Hewlett-Packard
Distortion Analyzer	330D	Hewlett-Packard
Random Noise Generator	1381	General Radio
Oscillator	1310-A	General Radio
True RMS Voltmeter	323	Ballentine

4.2 CALIBRATION PROCEDURE

Check that the 115/230 switch on the rear chassis is set to the expected line voltage, and that the fuse value is correct. Apply power and allow a 15-minute warmup. After warmup, remove the top cover and proceed as follows:

a. Connect a DVM to A6TP2; ground on chassis frame. Adjust A6R24 for -15V ±10 mV.

b. Connect DVM to A6TP1, and adjust A6R22 for +15V ±10 mV.

c. Set the front-panel controls as follows:

MULTIPLIER	1
g (RMS)	10
MODE	BYPASS

d. Adjust random noise generator for 2 kHz bandwidth and clipping level of 3 sigma. Apply 100 mV rms random noise signal to J1, ACCEL IN.

e. Connect DVM to A1TP8, and adjust A1R8 for 1.14 Vdc ±0.02 Vdc average. If necessary, select new value for A1R7 (nominally 8.66k, 1%).

CAUTION

If it is desired to extend card A1 to facilitate changing A1R7, be sure power is off before removing or replacing the circuit card. Observe the NOTE and CAUTION of paragraph 4.1.

4.2 CALIBRATION PROCEDURE (Cont'd)

f. Use a test oscillator and apply 1-kHz signal at 1 Vrms to J2, RANDOM IN.

g. Connect DVM alternately to A3TP4 and A3TP5, and adjust A3R16 for equal voltage readings.

h. Connect distortion analyzer to A3TP6. Adjust A3R5 for minimum distortion (less than 0.5%).

i. To ensure proper overall operation, perform the operational checkout procedure of paragraph 2.3 in Section II of this manual.

4.3 PARTS REPLACEMENT

Except for some special SDC specification-controlled parts that are listed in Table 4-2, which must be ordered from Spectral Dynamics Corporation, standard electronic parts have been used throughout the instrument. Spectral Dynamics Corporation maintains a complete stock of all parts and complete printed circuit card assemblies used in this instrument.

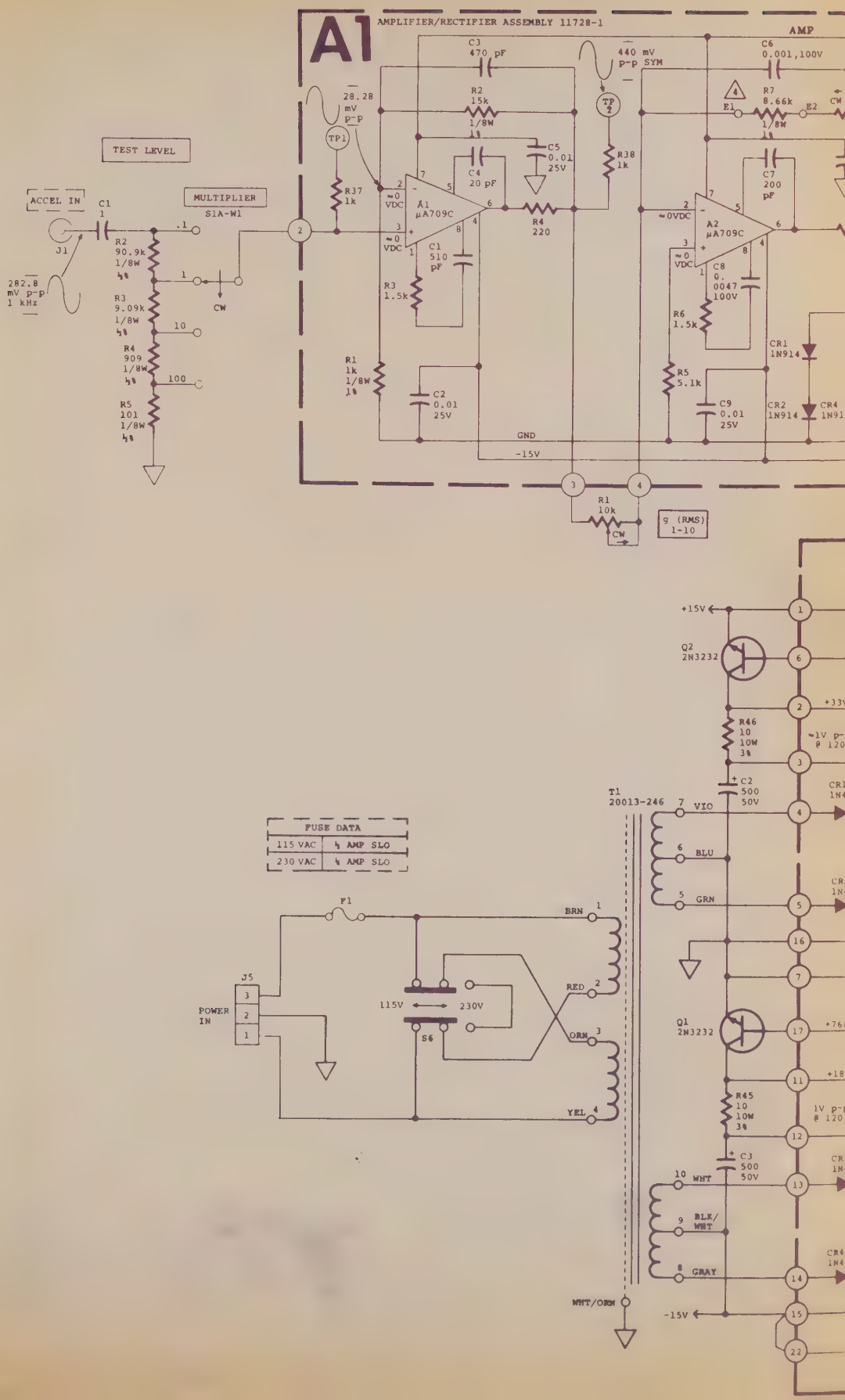
When ordering a replacement part or assembly, be sure to include the reference designation, the part number or manufacturers designation, and a complete description; include also the instrument name, model number, and serial number.

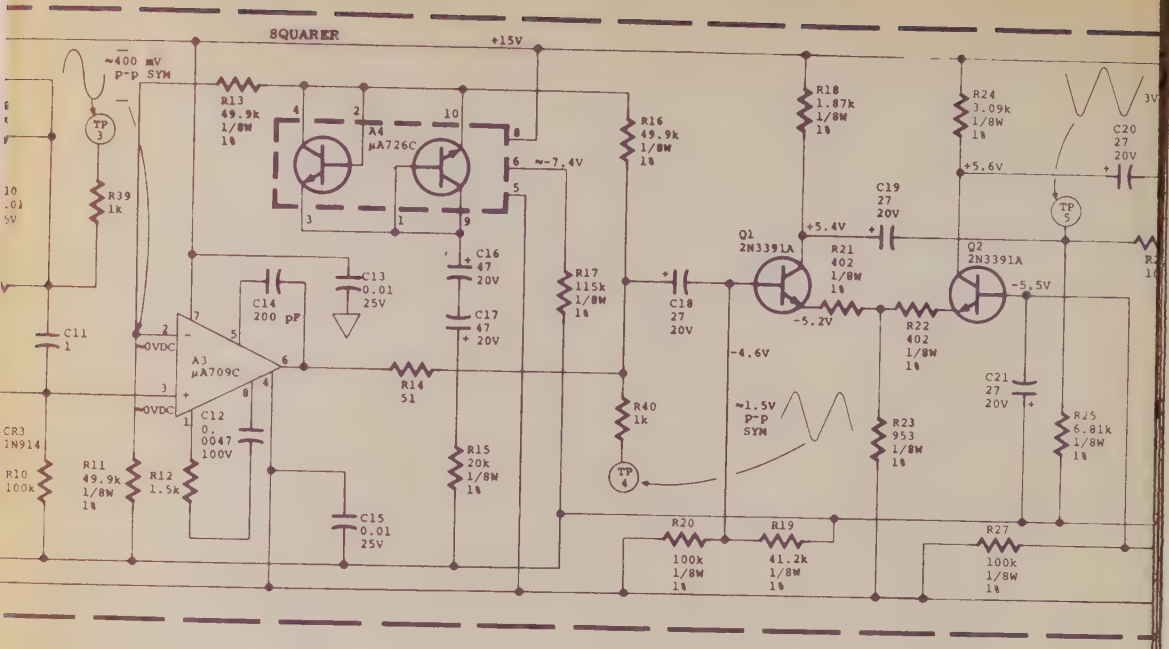
Table 4-2. Special Replaceable Parts List

Reference Designator	Description	Part Number/ Mfg. Designation
A1	Amplifier/Rectifier	11728-1
A2	Logic	11730-1
A3	AGC Amplifier	11732-1
A6	Power Supply	11628-1
A7	Extender	23060-1
	(Cont'd)	

Table 4-2. Special Replaceable Parts List (Cont'd)

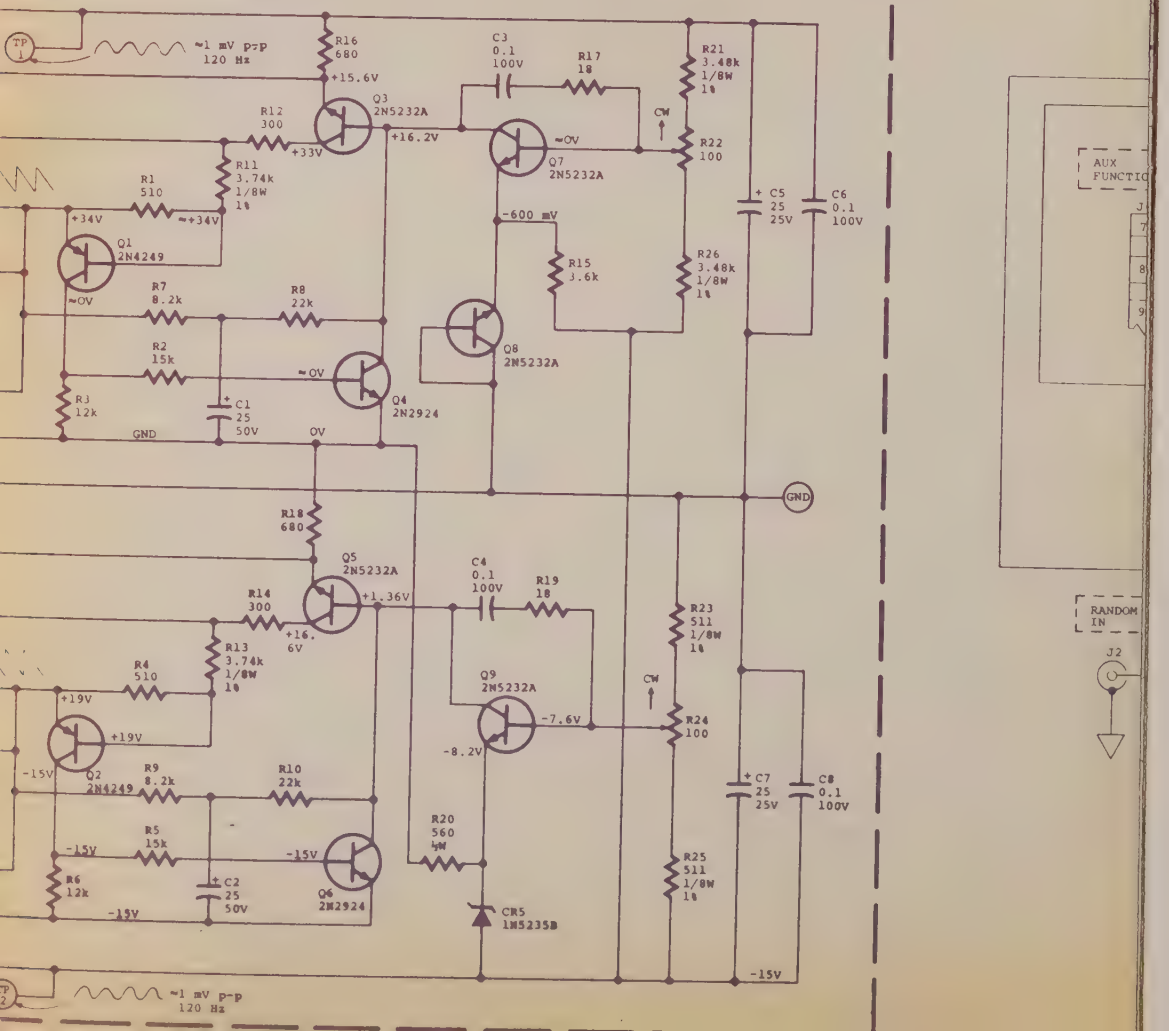
Reference Designator	Description	Part Number/ Mfr. Designation
DS1,3,4,5	Lamp, POWER, UNDER TEST, OVER TEST, TURN ON	CF03-RTS-2102
DS2	Lamp, BYPASS	CF03-ATS-2102
P4	Plug, AUX FUNCTIONS	GK-9-21C-1/2
S1	Switch, MULTIPLIER	20013-252
S2	Switch, MODE	20013-251
S3,S5	Switch, dB UNDER/OVER TEST	20013-253
S4	Switch, RESET	3PB7
S6	Switch, 115/230	46256LF
T1	Power Transformer	20013-246
	Knob, MULTIPLIER, MODE, etc.	20013-175
	Multidial, dB (RMS)	11-1-11
A3Q3/Q4	Transistors, matched pair	20013-044

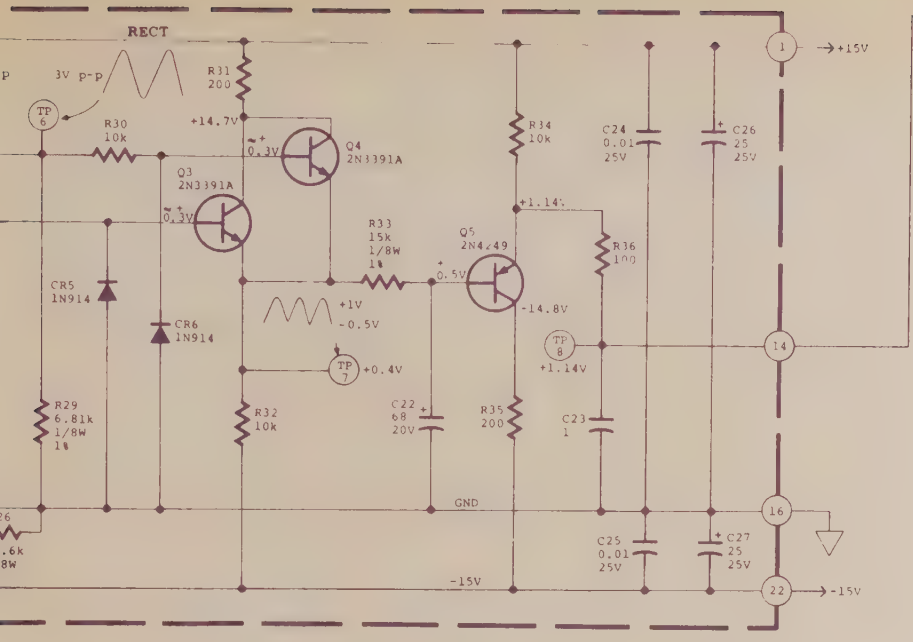

A1
AMPLIFIER/RECTIFIER ASSEMBLY 11728-1
AMP
TEST LEVEL
ACCEL IN
J1
282.8 mV p-p 1 kHz
C1
MULTIPLIER
S1A-W1
R2 90.9k 1/8W 1%
R3 9.09k 1/8W 1%
R4 909 1/8W 1%
R5 101 1/8W 1%
CW
28.28 mV p-p
TP1
R37 1k
C3 470 pF
R2 15k 1/8W 1%
C4 20 pF
C5 0.01 25V
A1 µA709C
~0 VDC
C1 510 pF
R3 1.5k
R1 1k 1/8W 1%
C2 0.01 25V
R4 220
440 mV p-p SYM
TP2
R38 1k
GND
-15V
C6 0.001,100V
R7 8.66k 1/8W 1%
E1
E2
C7 200 pF
A2 µA709C
~0VDC
C8 0.0047 100V
R6 1.5k
R5 5.1k
C9 0.01 25V
CR1 1N914
CR2 1N914
CR4 1N91
R1 10k
CW
g (RMS) 1-10
FUSE DATA
115 VAC ½ AMP SLO
230 VAC ¼ AMP SLO
F1
J5
POWER IN
115V
230V
S6
BRN
RED
ORN
YEL
T1 20013-246
VIO
BLU
GRN
WHT
BLK/WHT
GRAY
WHT/ORN
+15V
Q2 2N3232
R46 10 10W 3%
C2 500 50V
Q1 2N3232
R45 10 10W 3%
C3 500 50V
-15V

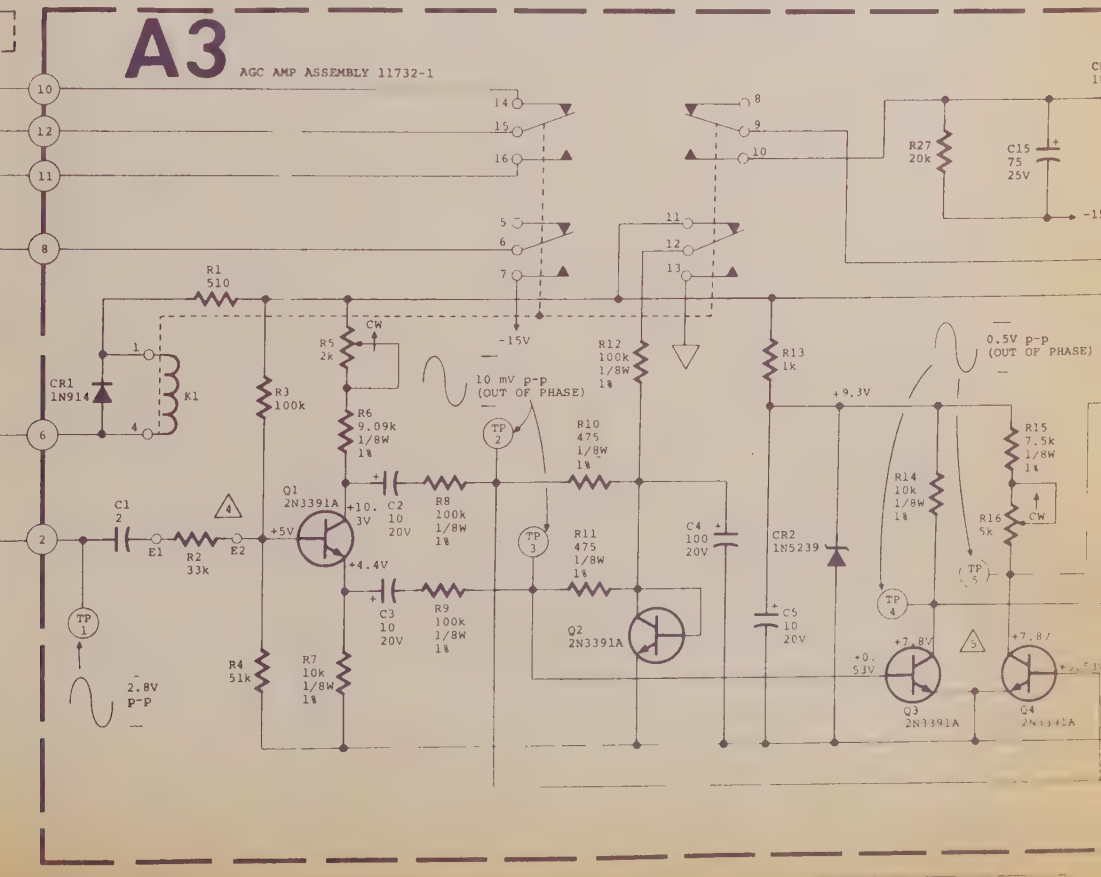


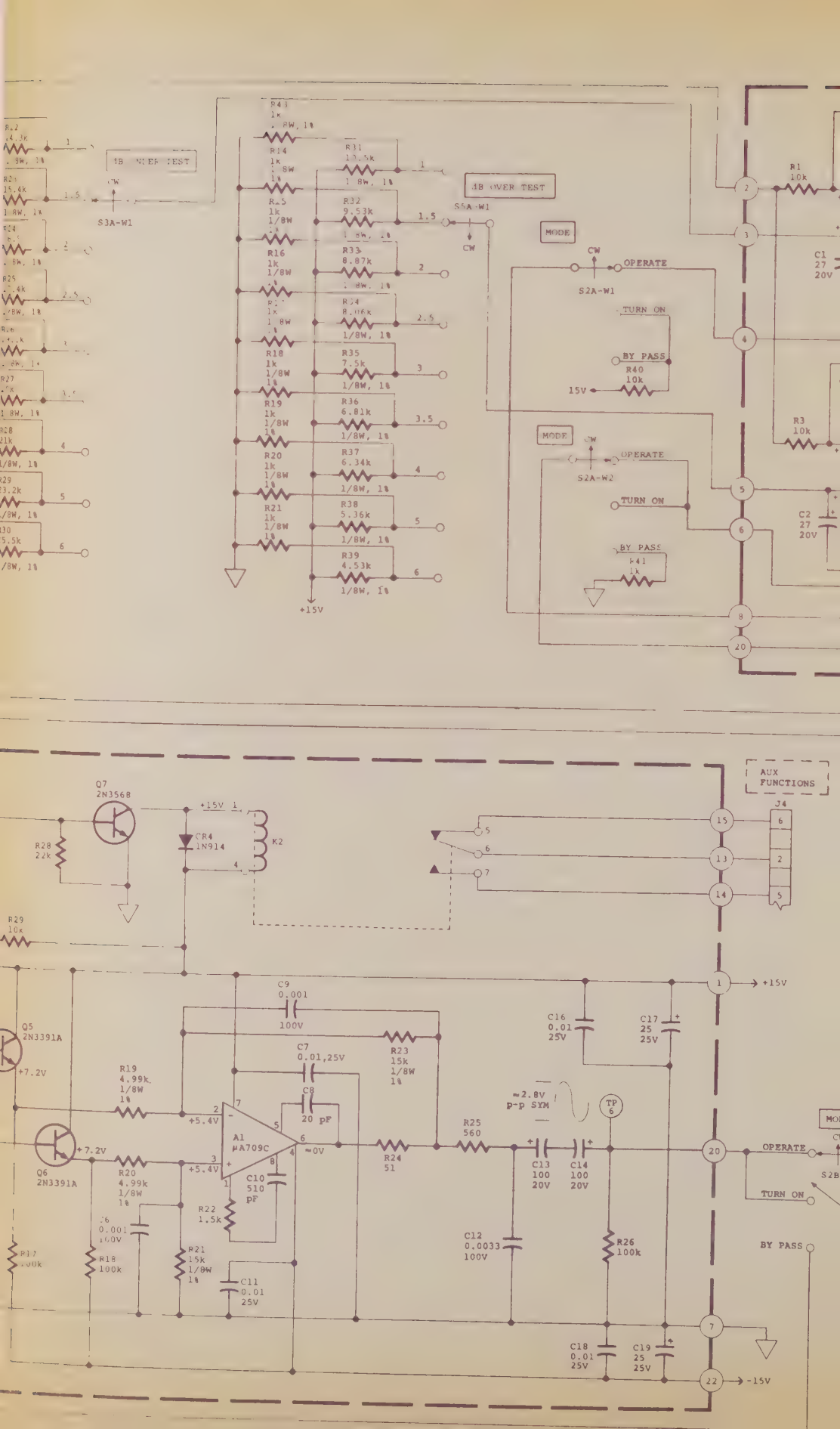
A6

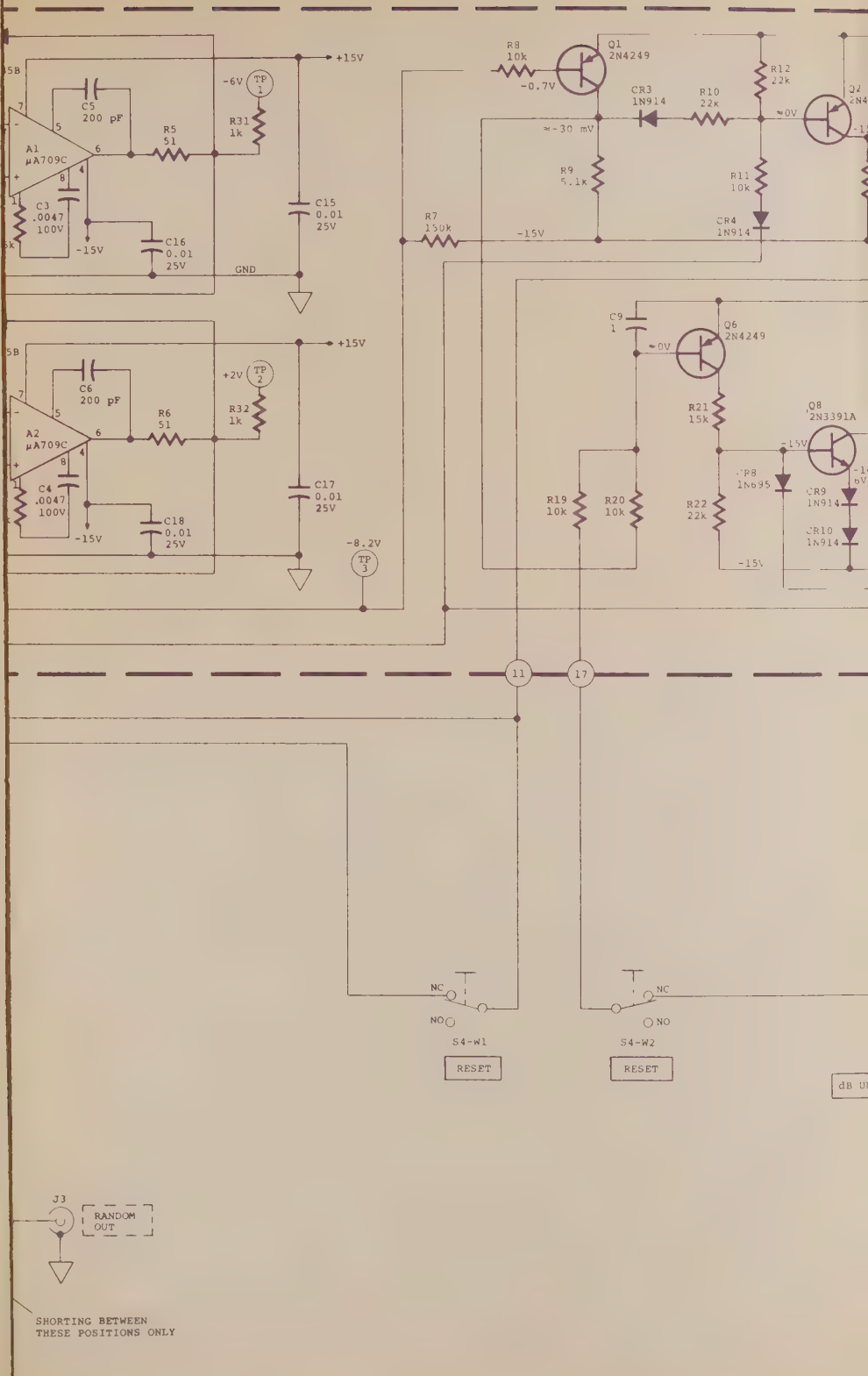
POWER SUPPLY ASSEMBLY 11628-1

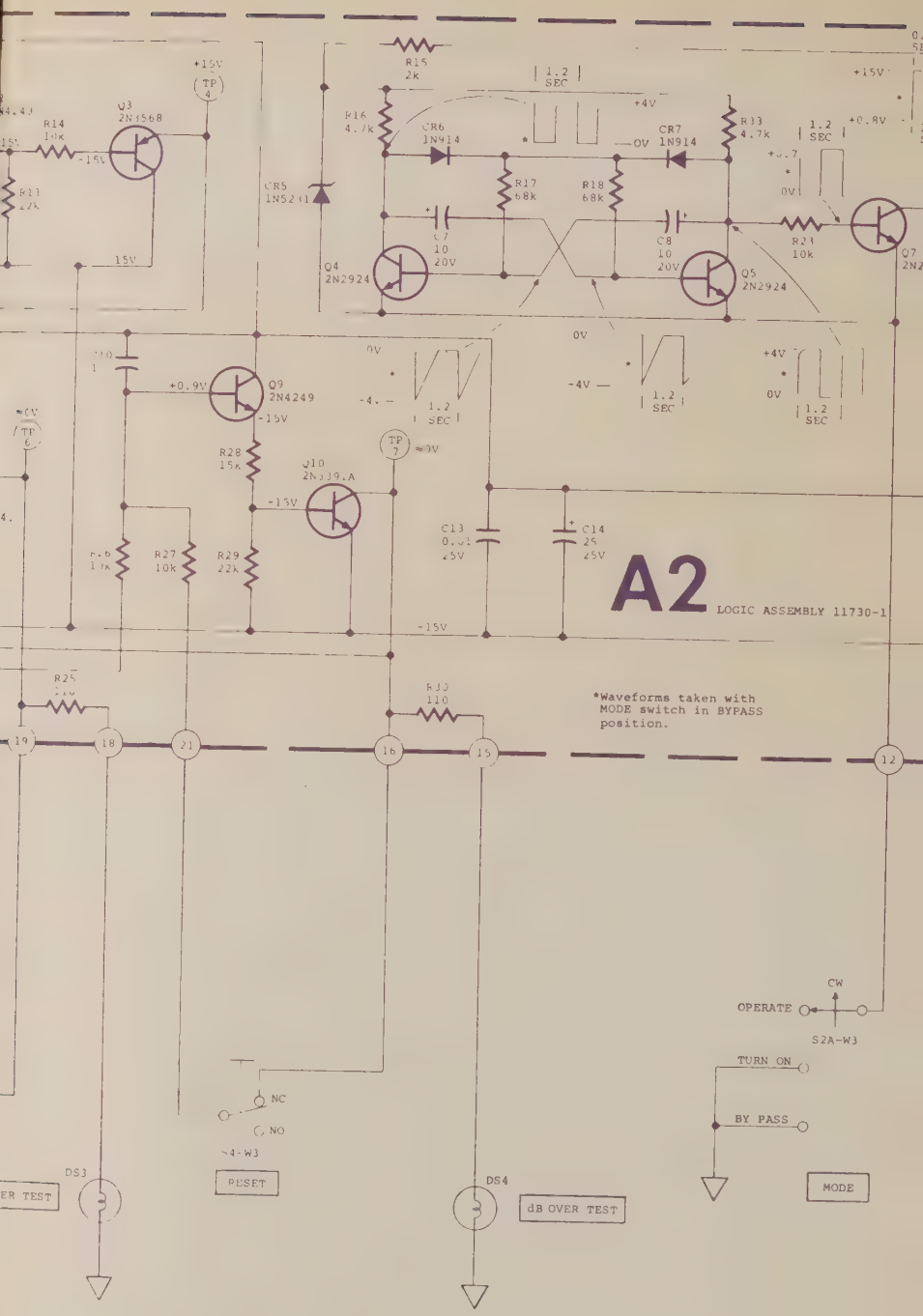



RECT
3V p-p
R31 200
TP 6
R30 10k
+14.7V
Q4 2N3391A
Q3 2N3391A
R33 15k 1/8W 1%
Q5 2N4249
CR5 1N914
CR6 1N914
+1V
-0.5V
TP 7
+0.4V
R29 6.81k 1/8W 1%
R32 10k
C22 68 20V
R35 200
R34 10k
C24 0.01 25V
C26 25 25V
+1.14V
R36 100
-14.8V
TP 8
+1.14V
C23 1
GND
C25 0.01 25V
C27 25 25V
-15V
1
+15V
14
16
22
-15V
R42 1k 1/8W, 1%
R6 1k 1/8W 1%
R7 1k 1/8W 1%
R8 1k 1/8W 1%
R9 1k 1/8W 1%
R10 1k 1/8W 1%
R11 1k 1/8W 1%
R12 1k 1/8W 1%
R13 1k 1/8W 1%
+15V


A3
AGC AMP ASSEMBLY 11732-1
10
12
11
8
14
15
16
5
6
7
8
9
10
11
12
13
R27 20k
C15 75 25V
R1 510
CR1 1N914
K1
R3 100k
R5 2k
CW
R6 9.09k 1/8W 1%
-15V
10 mV p-p (OUT OF PHASE)
TP 2
R10 475 1/8W 1%
R12 100k 1/8W 1%
R13 1k
+9.3V
0.5V p-p (OUT OF PHASE)
R15 7.5k 1/8W 1%
R14 10k 1/8W 1%
R16 5k
CW
C1 2
E1
E2
R2 33k
+5V
Q1 2N3391A
+10. 3V
C2 10 20V
R8 100k 1/8W 1%
+4.4V
TP 3
R11 475 1/8W 1%
C4 100 20V
CR2 1N5239
TP 5
TP 4
C3 10 20V
R9 100k 1/8W 1%
Q2 2N3391A
C5 10 20V
TP 1
2.8V p-p
R4 51k
R7 10k 1/8W 1%
+0.53V
+7.8V
Q3 2N3391A
+7.8V
Q4 2N3391A


4B OVER TEST
S3A-W1
CW
R43
1k
.8W, 1%
R14
1k
1/8W
1%
R31
13.5k
1/8W, 1%
R15
1k
1/8W
1%
R32
9.53k
1/8W, 1%
S5A-W1
4B OVER TEST
CW
R16
1k
1/8W
1%
R33
8.87k
1/8W, 1%
R18
1k
1/8W
1%
R35
7.5k
1/8W, 1%
R19
1k
1/8W
1%
R36
6.81k
1/8W, 1%
R20
1k
1/8W
1%
R37
6.34k
1/8W, 1%
R21
1k
1/8W
1%
R38
5.36k
1/8W, 1%
R39
4.53k
1/8W, 1%
+15V
MODE
CW
OPERATE
S2A-W1
TURN ON
BY PASS
R40
10k
15V
MODE
CW
OPERATE
S2A-W2
TURN ON
BY PASS
R41
1k
R1
10k
R3
10k
C1
27
20V
C2
27
20V
Q7
2N3568
R28
22k
CR4
1N914
K2
+15V
AUX
FUNCTIONS
J4
R29
10k
Q5
2N3391A
+7.2V
Q6
2N3391A
+7.2V
R19
4.99k
1/8W
1%
R20
4.99k
1/8W
1%
C9
0.001
100V
C7
0.01,25V
C8
20 pF
R23
15k
1/8W
1%
A1
μA709C
+5.4V
+5.4V
~0V
C10
510
pF
R22
1.5k
R24
51
R25
560
~2.8V
p-p SYM
TP
6
C16
0.01
25V
C17
25
25V
C13
100
20V
C14
100
20V
C12
0.0033
100V
R26
100k
R18
100k
R21
15k
1/8W
1%
C11
0.01
25V
C18
0.01
25V
C19
25
25V
+15V
-15V
OPERATE
TURN ON
BY PASS


A1 µA709C
A2 µA709C
C5 200 pF
C6 200 pF
C3 .0047 100V
C4 .0047 100V
C16 0.01 25V
C15 0.01 25V
C18 0.01 25V
C17 0.01 25V
R5 51
R6 51
R31 1k
R32 1k
+15V
-15V
GND
-6V
+2V
-8.2V
TP 1
TP 2
TP 3
Q1 2N4249
Q6 2N4249
Q8 2N3391A
R8 10k
R7 150k
R9 5.1k
R10 22k
R11 10k
R12 22k
CR3 1N914
CR4 1N914
CR8 1N695
CR9 1N914
CR10 1N914
C9 1
R21 15k
R22 22k
R19 10k
R20 10k
-0.7V
≈-30 mV
≈0V
11
17
NC
NO
S4-W1
S4-W2
RESET
J3
RANDOM OUT
SHORTING BETWEEN THESE POSITIONS ONLY



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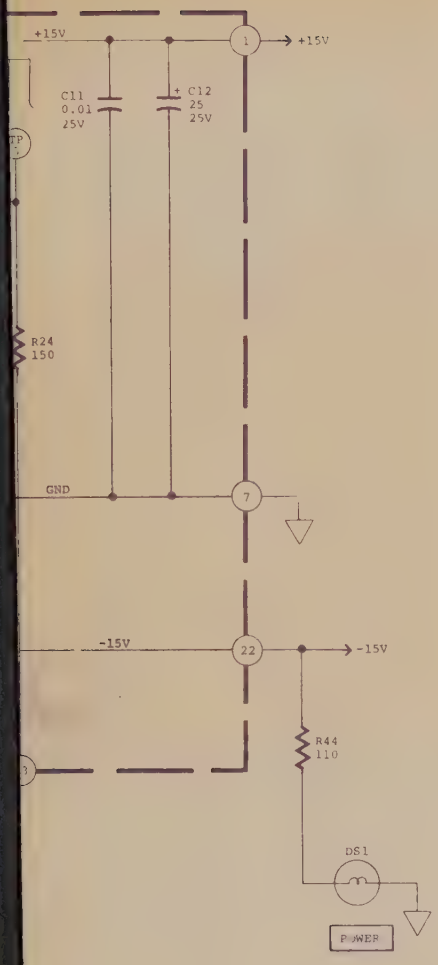
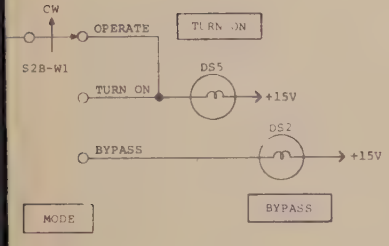




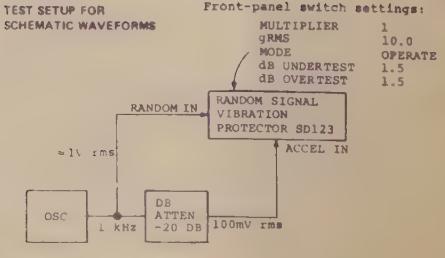
REVISIONS						
REV	ECO	S N	DESCRIPTION	DRAFT	CHECK	APP D
A	——	011	RELEASED	m.T		
——	DDC	011	R45 & R46 WERE R1 & R2			
B	619	011	S2B-W4 WAS S2B-W2. A1CR5 WAS 1N5231.	DP	5/21/69	
B	——	011	REDRAWN	G.B.C. 4-24 69	4/24/69	5/6/69

NOTES:

1. UNLESS OTHERWISE SPECIFIED, ALL RESISTOR VALUES ARE IN OHMS ±5%, ¼W; ALL CAPACITORS IN MICROFARADS ±10%, 200V.
2. SYMBOL [ ] INDICATES FRONT PANEL LOCATION.
3. SYMBOL [ ] INDICATES REAR CHASSIS LOCATION.
4. FACTORY ADJUST WITH OPTIMUM VALUE SHOWN.
5. SELECT PER SDC SPEC 20013-044.

NOTE

TEST SETUP FOR SCHEMATIC WAVEFORMS



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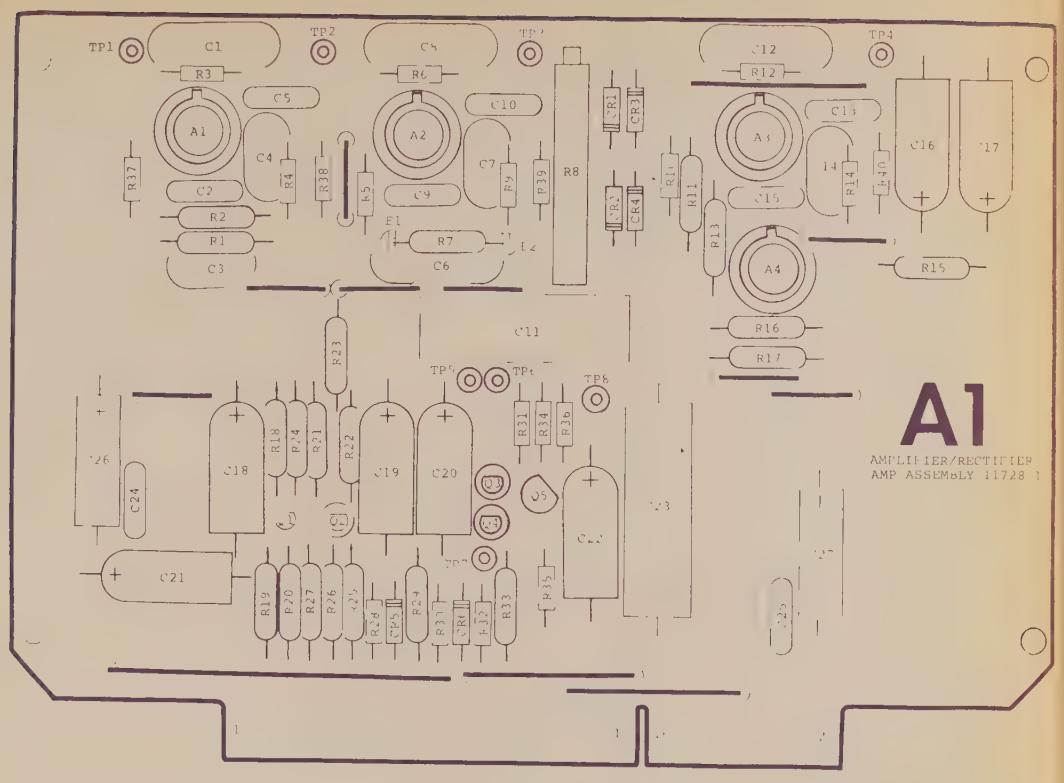
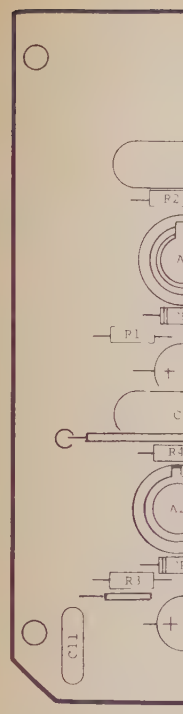
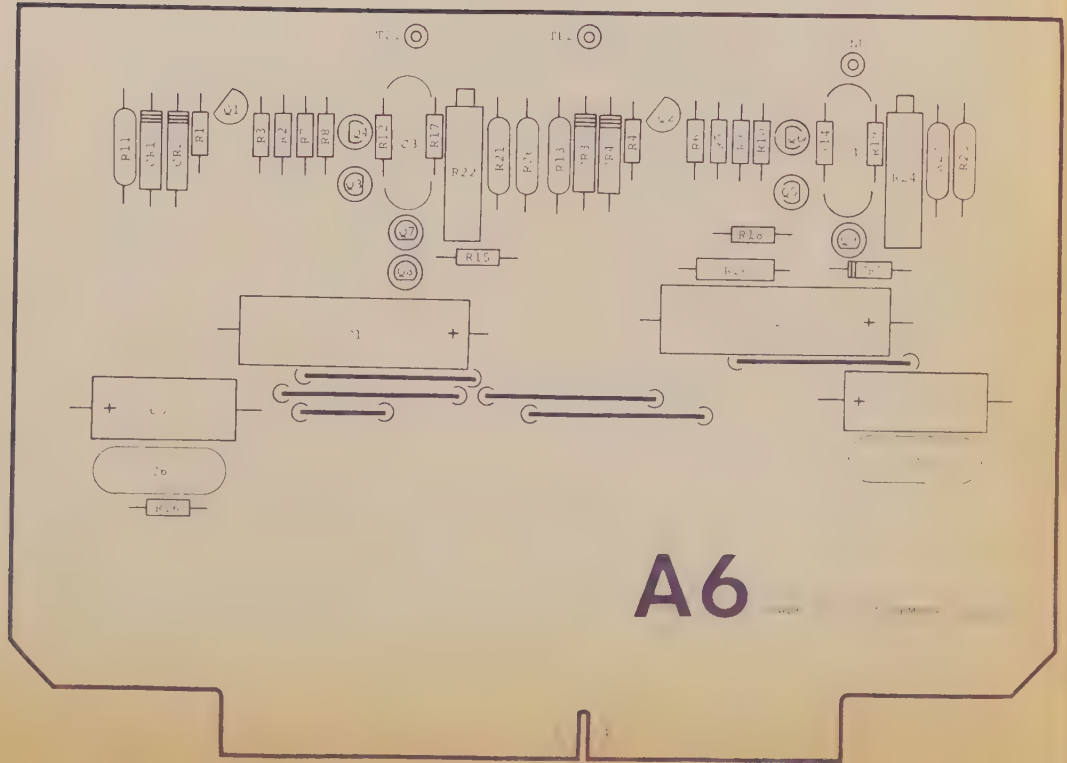
SPECTRAL DYNAMICS CORPORATION OF SAN DIEGO

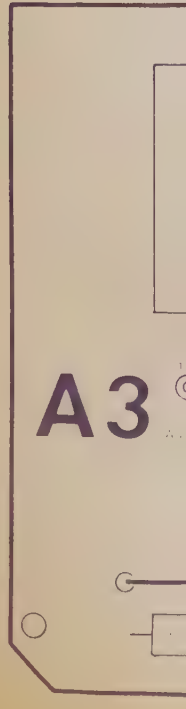
TITLE
SCHEMATIC/COMPONENT LAYOUT –
MODEL SD123
RANDOM SIGNAL VIBRATION PROTECTOR

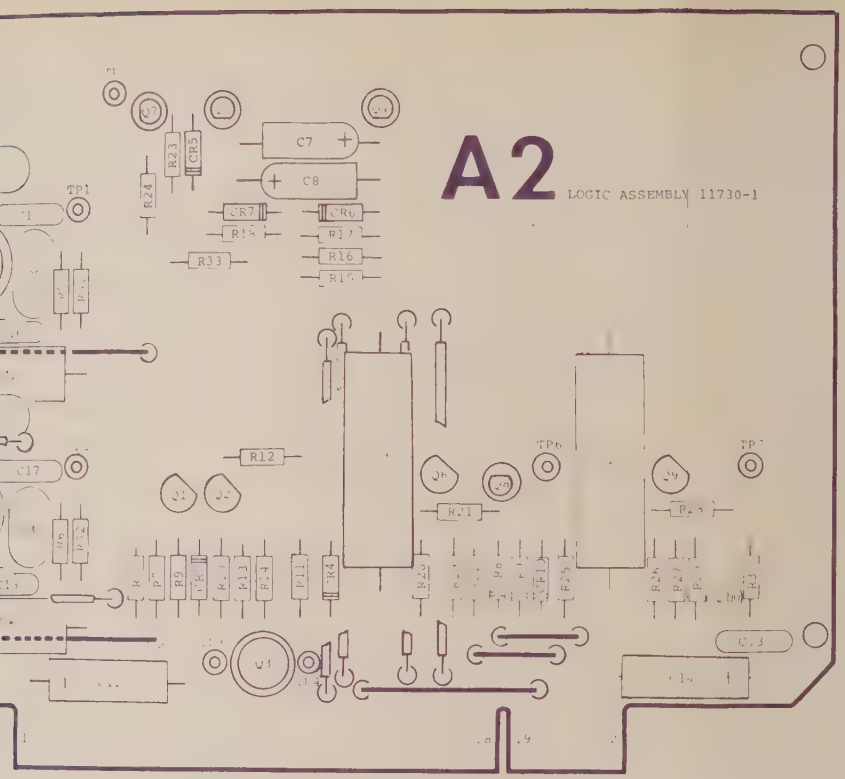
DRAWN		SIZE	DRAWING NO	REV
CHECKED			11726	B
ENGINEER				
			SHEET 1 OF	


A1
AMPLIFIER/RECTIFIER
AMP ASSEMBLY 11728

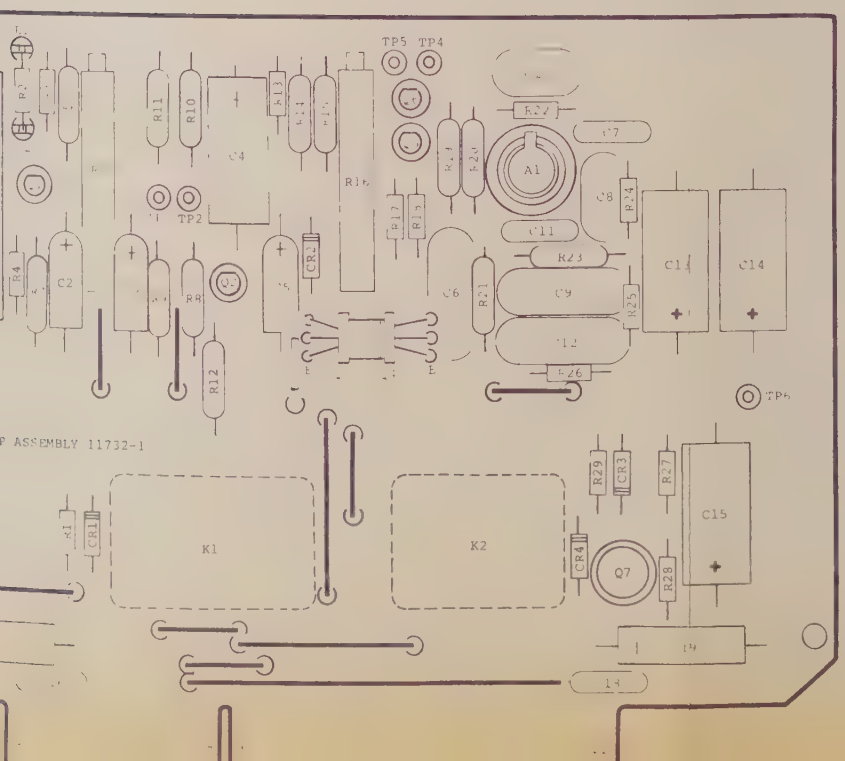



A6


A3



REVISIONS						
REV	ECO	S N	DESCRIPTION	DRAFT	CHECK	APP'D
			SEE SHEET 1			



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SPECTRAL DYNAMICS CORPORATION OF SAN DIEGO

TITLE
SCHEMATIC/COMPONENT LAYOUT –
MODEL SD123
RANDOM SIGNAL VIBRATION PROTECTOR

DRAWN	G.B.CLARE	4-24-69
CHECKED		
ENGINEER		5/2/69
APPROVED		

SIZE	DRAWING NO	REV
	11726	B

SCALE — SHEET — OF